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ABSTRACT

The purpose of this study was to examine the effects of a systematic exercise program on sedentary males. The 12 male volunteers were all in occupations which did not require strenuous physical exercise, and they were not carrying out any regular program of exercise. (The mean age for the group was 46 years.) A battery of anthropometric tests and a standard bicycle ergometer test of heart rate performance were administered at four intervals over four months. Heart rate response to the bicycle ergometer test revealed a reduction of heart rate over each of the four tests from test 1 to test 4. No significant changes occurred in anthropometric measures, although some reduction of superficial facts was apparent. (PB)

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The Heart Rate Response of Adult Males to a Systematic Exercise Program

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Heart Rate Response of Adult Males to a Systematic Exercise Program

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Purpose and Overview

This study was designed to examine the effects of a systematic exercise program, as advocated by Cooper[1], on sedentary adult males. A standard ergocycle test, involving a graded increase in work load, provided an evaluation of heart rate performance to a maximum of 150 beats/minute. The examination of heart rate included a qualitative evaluation of the pattern of response augmented by a quantitative evaluation of the magnitude of response.

Subjects

Twelve subjects volunteered for the study, nine University of North Dakota professors and three Grand Forks businessmen. The group varied in age from 41 to 60 years with a mean age of 46 years. Their occupations did not require strenuous physical activity and none was engaged in any regular program of exercise.

Procedure

The study was conducted over a four month period (October, 1968, to January, 1969.) After receiving approval from their physicians, subjects were given two tests the first being a standard work test, employing the bicycle ergometer. The twelve-minute walk/jog/run test devised by Cooper was also given, following which subjects were classified as to their fitness status. The subjects then began training using the point system established by Cooper[1]. Subjects were instructed to earn a minimum number of points dependent upon their fitness level. They were to participate in one or more activities of their own choice from three to seven days per week. Points for exercise participation were recorded by each subject on a master chart which displayed both the required minimum and the achieved total points for the previous week. The subjects were instructed to continue their regular diet, sleep, and smoking habits.

The ergocycle tests, repeated every five weeks, provided a total of four different tests during the duration of the study. The test began at a work load of 300 kilopond meters per minute, with a pedalling rate of 50 RPM's. After six minutes, the work load was increased to 600 kilopond meters (pedalling rate remaining constant.) If the heart rate of the subject had not reached 150 beats/minute after these 12 minutes of exercise, the work load was increased to 900 kilopond meters at 50 RPM's. The work load was thus increased every six minutes until the heart rate reached 150 beats/minute.

To indicate a change in physique which might influence heart rate response, other measurements were taken during the testing session. These included six skinfold fat measures, six circumferential measurements, and body weight. The means of these data appear in Table 1.

Results and Discussion

None of the 12 subjects accrued more than the minimum points during any one week. Table 2 shows the mean achieved points and mean minimum points per week at four week intervals between each ergocycle test. The achieved mean points were less than the mean minimum points at each test interval.

Figure 1 shows the mean minute heart rate over Tests 1, 2, 3 and 4. Heart rate adjustment occurred after one minute of exercise at the 300 kilopond meter per minute work load. The adjustment time is the same for all tests at this level of work, however the magnitude of the heart rate decreases. Test 1 adjustment heart rate was a high of 96 beats per minute compared to a low 88 beats per minute for Test 4 heart rate. After reaching the adjustment point the heart rate levelled off to the sixth

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minute of exercise.

Heart rate adjustment occurred after two minutes of exercise at the 600 kilopond meter work load. The heart rate for Test 1 at adjustment was 116, compared with a rate of 105 during the same interval in Test 4. The heart rate continued to increase during the remainder of this work load, although at a reduced rate. This is in contrast with the constant heart rate pattern following adjustment at the 300 kilopond meter work load.

All subjects completed 12 minutes of exercise on each test. However, the 900 kilopond meter work load resulted in a heart rate of 150 beats/minute for some subjects, and the test was terminated for them. Since the pattern of response from this point may be altered as a result of the reduced N, a qualitative analysis based on group results would be misleading and was not attempted. The mean terminal time for Test 1 was 15.0 minutes. Tests 2 and 3 showed successively longer mean terminal times, 16.0 minutes and 18.4 minutes respectively. However, the mean terminal time for Test 4 (16.5 minutes) was less than Test 3. Since the Christmas vacation occurred between Tests 3 and 4, this reversal may be attributed to a reduction of activity. In fact, the mean achieved scores (Table 2) show a proportional drop in activity.

Conclusions

1. A decrease in heart rate is shown at all levels of work intensity. This adjustment with training is evidence of an increase in heart rate efficiency.
2. The pattern and magnitude of heart rate response appears to be related to the exercise intensity, although the heart rate increment from one work load level to the next remains approximately the same.
3. The mean pedalling time to maximum heart rate increased from Tests 1 to 3. This performance is related to an increase in achieved points for exercise whereas, the decrease in Test 4 pedalling time is related to a decrease in achieved points.

Epilogue

The extreme interest shown by the subjects, as evidenced by their regular workout habits, their faithfulness in taking tests, and their overall enthusiasm in wanting to know the results of their tests indicated that a similar type program has significant good-will benefits for the physical education department.

Bibliography

1. Cooper, K. H. Aerobics. New York: Bantam Books, Inc. 1968.

Table 1

Means of Anthropometric data taken at each Ergocycle test session (N=12)

MEASUREMENT	TEST #1	TEST # 2	TEST #3	TEST #4
Age (yrs.)	45	45	46	46
Weight (lbs.)	183	184	183	185
Height (ins.)	72	72	72	72
Chest fat (mms.)	19	15.8	15.3	14.7
Umbilical fat (mms.)	30	30.5	30.3	28.5
Iliac fat (mms.)	18	16.9	14.1	13.5
Subscapulas fat (mms.)	17	16.8	15.3	16.2
Triceps fat (mms.)	13	12.8	13	13
Front thigh fat (mms.)	*	16.5	15.0	17.9
Upper arm circumference	31	32.4	33.6	32.5
Thigh circumference	50	51.9	53.1	52.4
Chest circumference	95.9	99.8	100.4	98.7
Waist circumference	92	93.3	93.9	92
Calf circumference	38	38.1	38.4	37.5

*measurement not taken on first test.

FIGURE 1. MEAN MINUTE HEART RATE FOR TWELVE ADULT MALES TO A STANDARD ERGOCYCLE TEST OVER A FOUR MONTH PERIOD

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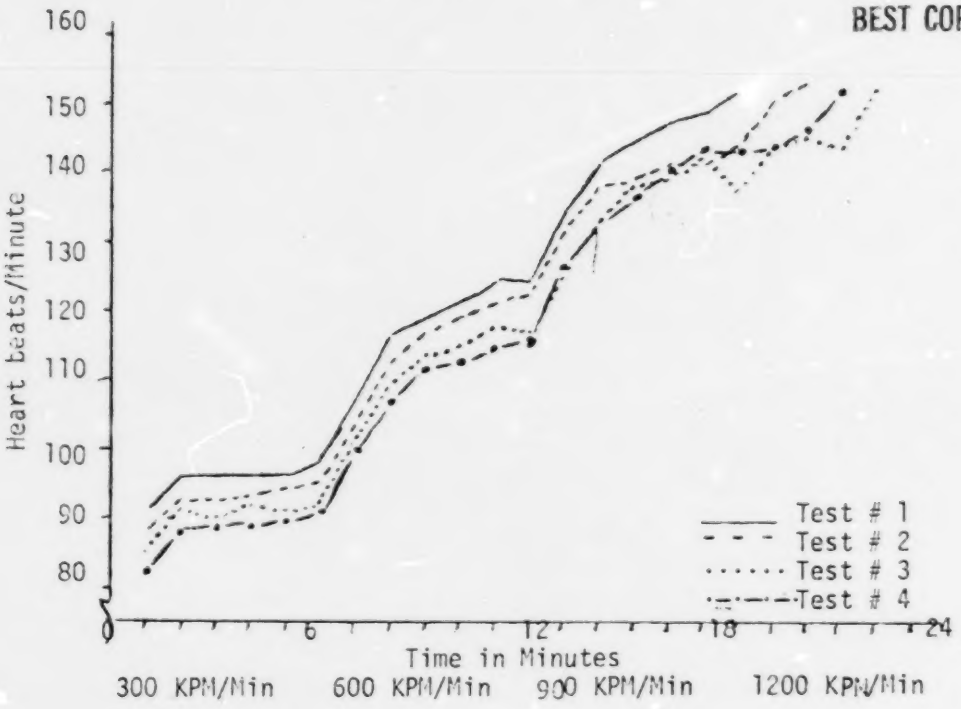

TABLE 2

Achieved and Minimum mean points for exercise participation by weeks between the test intervals. (N=12)

STUDY PERIOD		MEAN ACHIEVED	MEAN MINIMUM
Test #1	Weeks 1-5	13 pts.	14 pts.
Test #2	Weeks 6-10	16 pts.	24 pts.
Test #3	Weeks 11-15	18 pts.	29 pts.
Test #4			